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MAINTENANCE AND CALIBRATION
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EXACT

TYPE 200
WAVEFORM SYNTHESIZER
AND
PLUG-IN GENERATORS

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Exact Electronics, Inc.
P. O. Box 552
Portland 7, Oregon

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TYPE 200
WAVEFORM SYNTHESIZER
AND
PLUG-IN GENERATORS

OPERATING PROCEDURE

The triggering of the basic increments as well as the amplitude and configuration of the final output is controlled by the Plug-in generator used. Therefore, a more complete operational procedure will be described under the "OPERATING PROCEDURE" section of the Plug-in generator itself.

I. OPERATING SEQUENCE

The levels are switched in forward sequence only, starting with the upper left hand corner. This would be row A, increment #1. Each trigger from the plug-in switches to the next successive horizontal increment #2, #3.....#10; at this point the next trigger switches to the next lower horizontal row or row B*, increment #1 and repeats as in row A. There is no time interval between the 50th increment and 1st increment except for the risetime itself which is constant.

* An entire row may be switched out and thereby eliminated completely. If, for instance, row B were turned OFF, the next trigger would cause the unit to switch from Row A, increment #10 to Row C, increment #1.

CAUTION: Level switching is done by ring counters and if you turn a Row switch to OFF while that particular row is still switching, the unit will continue to run on that row only. If this happens turn the Row switch ON then OFF again or go to a slower TIME/INCREMENT speed where it is easy to observe the operation of the rows.

II. NEON INDICATION

The neon indicators show which decade row is on and also the individual increment being switched.

CALIBRATION PROCEDURE & MAINTENANCE GUIDE

This is the calibration procedure used at the factory which assures that the stated operational specifications can be met. We hope that you will find it useful for recalibration as well as in periodic trouble shooting and maintenance.

The trouble shooting suggestions have been arranged in order of progressive calibration. This is to allow you to more easily isolate the malfunction by its place in the sequence of operation. Since many later steps depend on the proper performance of prior operations, it would be most wise to check back to the beginning on all troubles and eliminate this possibility. For example if you have instability of several increments you might suspect the matrix or, quite logically, the trigger circuits. However, the trouble might well be the -210 volt power supply out of regulation. Eliminate fundamental problems (such as the power cord being plugged in!) before trouble shooting specific areas.

All tests should be made with a voltmeter having 20,000 ohms/volt and a dependable oscilloscope with the following characteristics.

(a) Input impedance at least 1 Megohm
(b) Horizontal sweep accuracy - 3%
(c) Capable of being externally triggered

CALIBRATION SEQUENCE

IF UNABLE TO MAKE SPECIFICATIONS

1. VISUAL CHECK
   Obvious damage
   Missing or unlit tubes
   Wrong control settings
   Improper test equipment

Install a plug-in and turn Type 200 ON	
Set TIME/INCREMENT	100usec
Trigger Source	INT
Trigger Mode	NORMAL

2. POWER SUPPLY VOLTAGES

(a) Adj. -210V ADJ. 10mv ripple	(a) If no power, check Thermal cut-out Replace tubes V101 then V103, then V102, V104 Check line voltage (105-125V) Check R131/R133 ratio Check for open rectifiers - half wave rectification Check C104 Check load
(b) +100V (± 3%) 15mv ripple	(b) Replace tubes Check R115/116 ratio Check for open rectifiers Check C102 Check load
(c) +250V (± 3%) 15mv ripple	(c) Replace Tubes Check R106/R107 ratio Check for open rectifiers Check C101 Check load
(d) -60V (55 volts)	(d) Replace V313 Check R141, C313 Check load for bad diodes or open
(e) Check regulation of all voltages from 105-125 line volts	(e) Recheck (a) (b), etc.

3. DECADE TRIGGER

Put test scope probe on cathodes of V205, V210, etc.
Trigger scope from SYNC OUT of Plug-in

(a) Check unit switching -7 to 10 volt triggers and neon indication of sequential operation

(a) Check UNIT TRIG ADJ.* in plug-in
Try new plug-in or check plug-in procedure
Replace trigger tubes V205, V210, V215, etc.
Replace switching tubes V204, V209, V214, etc.
Remove readout tubes V202, 203, 207, 208, etc. to isolate

Turn all Type 200 Row switches On. Put test scope probe on PRIMARY MATRIX output. Externally trigger scope from SYNC OUT.

(b) Adjust DECADE TRIG ADJ.** Adjust for optimum position with all 50 increments running. (May require re-adjustment of UNIT TRIGGER* in plug-in)

(b) Check for bad row switch
Replace V317B
Check for 5 volt pulse at grid of V317B
Replace trigger tubes V303, V306, etc.
Replace switching tubes V302, V305, etc.
Replace T201

(c) LINE VOLTAGE vs TRIGGER
Vary line voltage from 105-125V and check continuity of triggering

(c) Same as (b)

(d) Check triggering over entire timing range of plug-in

(d) Check plug-in operation same as (b)

** On some instruments this control may be labeled "VERT TRIG"

* On some Plug-ins this may be labeled "HOR TRIG"

4. READOUT - PRIMARY MATRIX

Turn first 3 or 4 primary matrix controls alternately CW and CCW
Scope probe on PRIMARY MATRIX output

(a) Adj. MATRIX COMP. C201 for squarest and flattest increments

(a) Replace V105
Replace L201

Change TIME/INCR on plug-in to 10usec.
Turn all levels CCW except one.

(b) Adj. H.F. ADJ. L201 for sharpest leading edge

(b) Replace V105
Replace L201

5. READOUT - SECONDARY MATRIX

Place scope probe on SECONDARY MATRIX output and repeat as in step 4.

Repeat step 4, (a) & (b) with C201S and L201S

With Scope on SECONDARY MATRIX bring first 10 secondary levels to mid voltage.
Set TIME/INCR. on plug-in to 100usec.

6. READOUT COMPENSATION

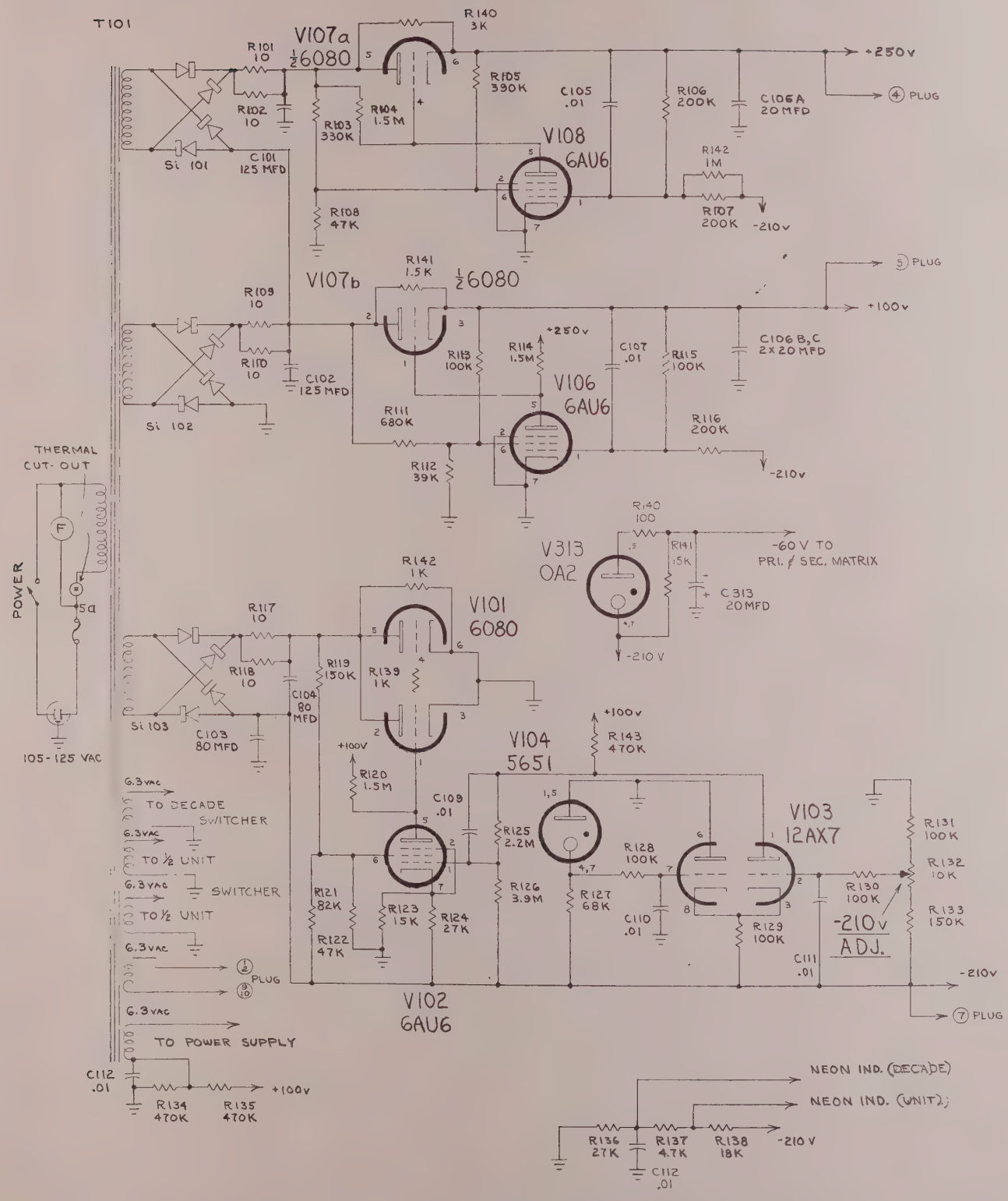
(a) Adjust READOUT LEVEL ADJ. R2000 for best compromise of positive and negative spikes

(b) Adj. secondary READOUT COMP. C2011 thru C2020 for best compromise on the individual switching spikes

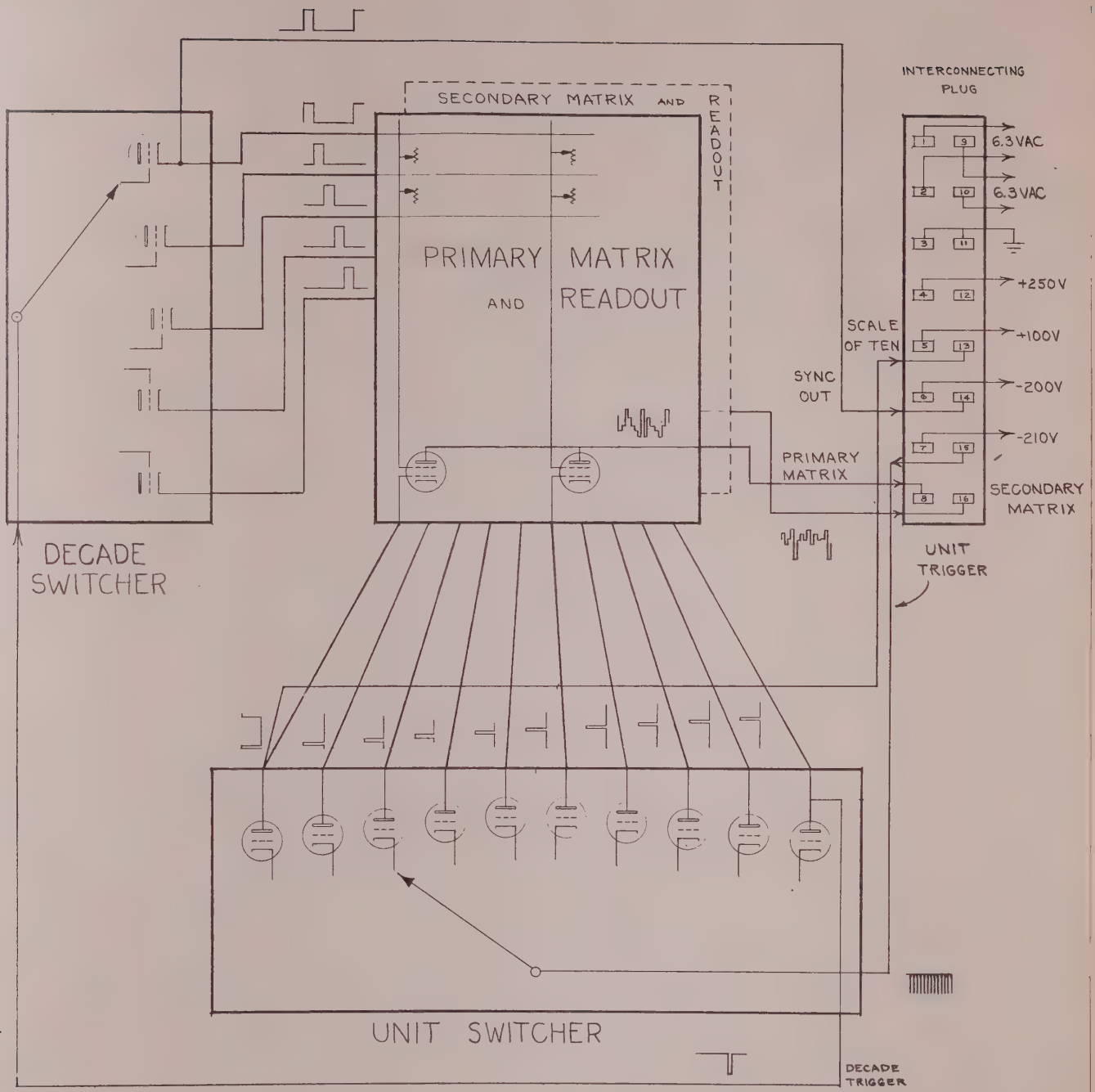
(b) Replace corresponding readout tube V203, 208, etc.
Replace trimmer

Put scope probe on PRIMARY MATRIX and observe as in step (b)	
(c) Adj. primary READOUT COMP. C2001 thru C2010 as in step (b)	(c) Corresponds to (b)
7. MATRIX OPERATION	
(a) Check full 10V range and general operation of each individual primary and secondary matrix increment	(a) If a vertical row (2nd, 12th, 22nd, etc.) is bad or interacts check corresponding readout tube, V202, 203, etc. If an individual increment - check diode, check pot, check -55 volts
(b) Check neon indicators	(b) Check neon supply voltages Replace bulb
8. DECADE SWITCHING	
(a) Turn row switches ON & OFF and check proper operation *(Note comment in OPERATING PROCEDURE)	(a) Repeat step 3 (b)
(b) Check neon indication	(b) Check voltage supply and dividers Replace neons
9. AUXILIARY OUTPUTS TO PLUG-IN	
(a) SCALE OF TEN	(a) Replace V317 (Recheck decade trigger)
(b) SYNC OUT	(b) Check R359

POWER SUPPLY

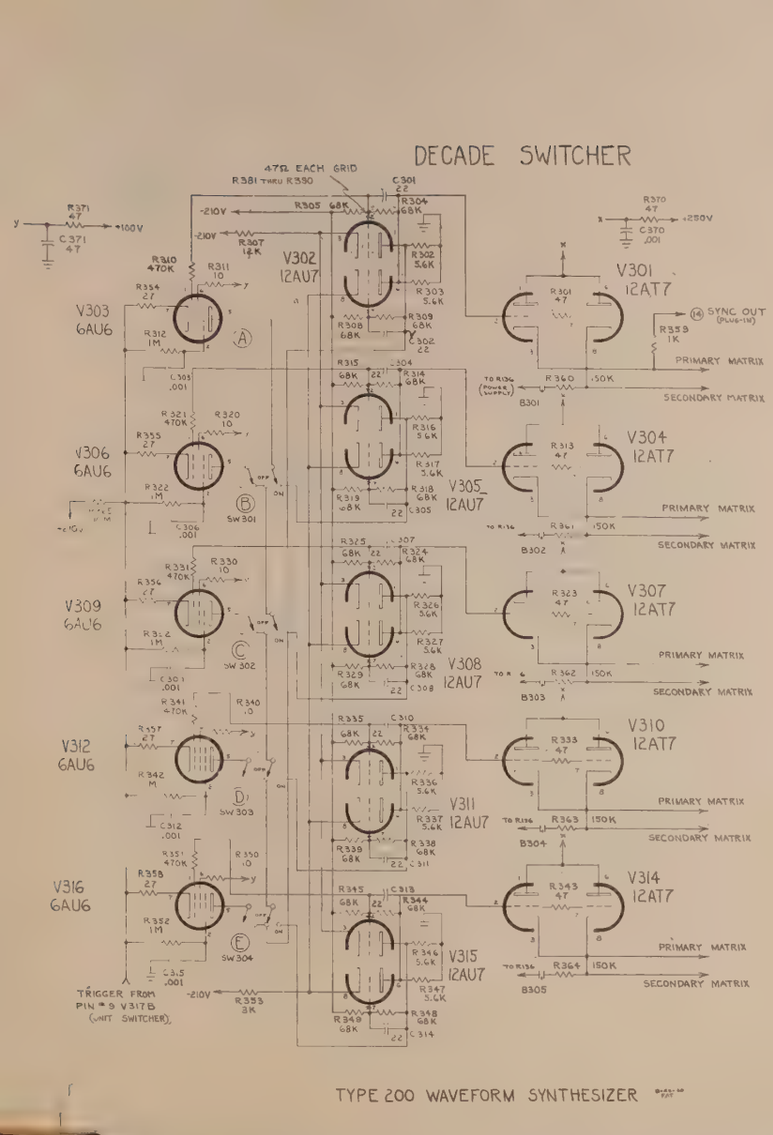


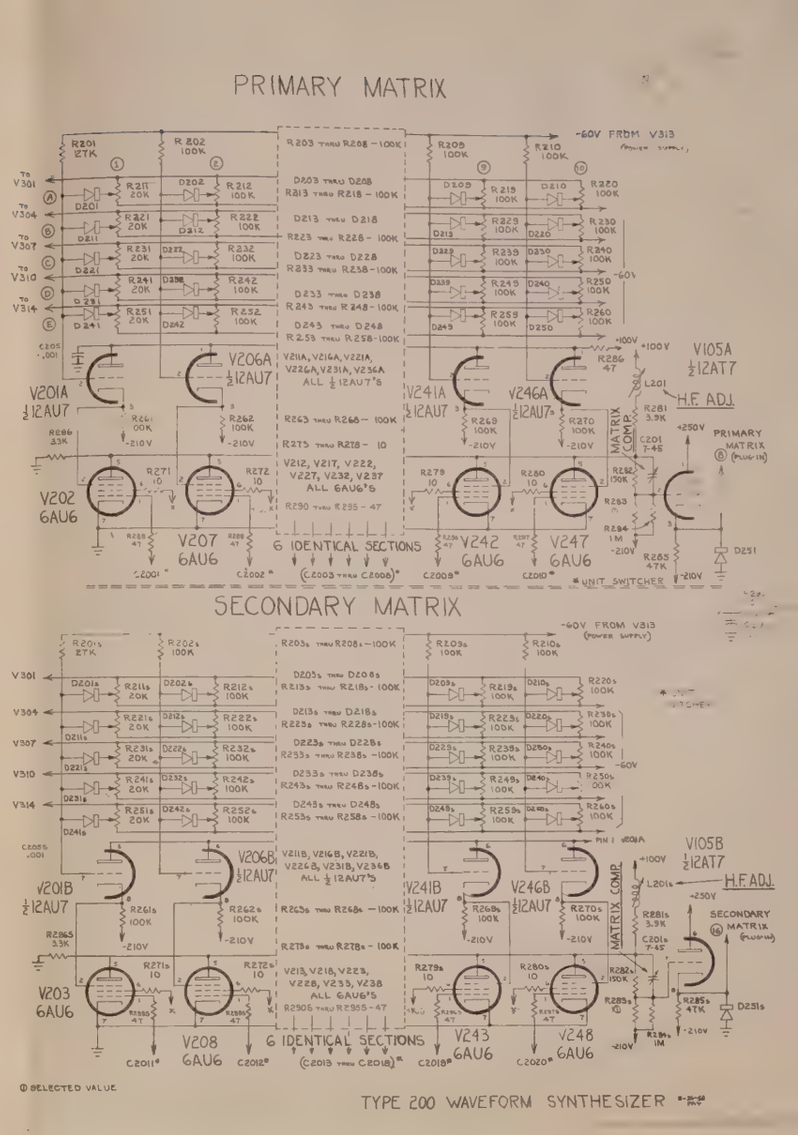
TYPE 200 WAVEFORM SYNTHESIZER 9-26-60 EAT

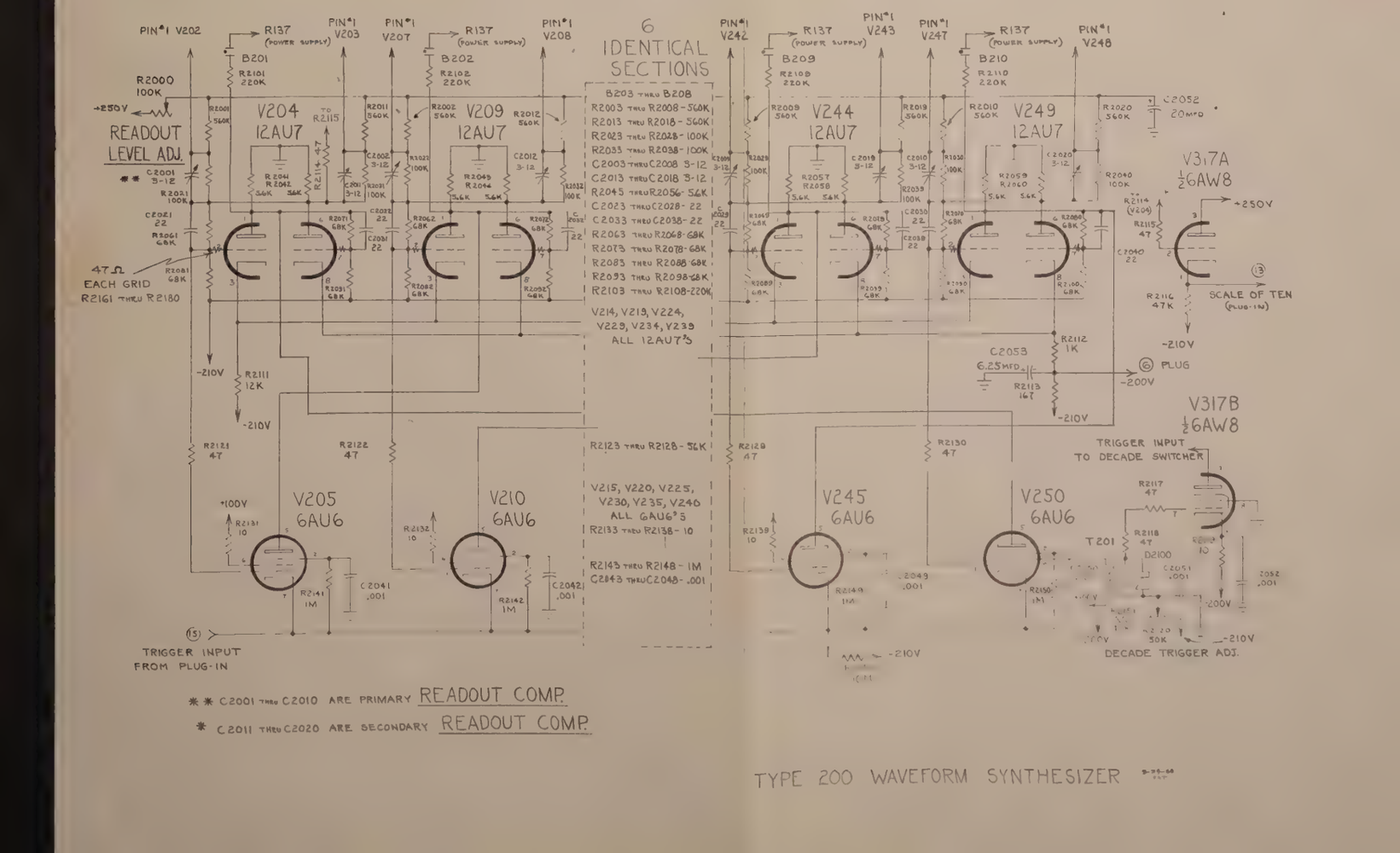


BLOCK DIAGRAM

TYPE 200 WAVEFORM SYNTHESIZER 9-27-60 PAT


DECADE SWITCHER
47Ω EACH GRID
R381 THRU R390
C301
.22
-210V
R305 68K
R304 68K
+100V
R371 47
C371 47
R307 1K
R310 470K
R311 10
V302 12AU7
R302 5.6K
R303 5.6K
+250V
R370 47
C370 .001
V303 6AU6
R312 1M
R354 27
V301 12AT7
R301 47
SYNC OUT (PLUG-IN)
R359 1K
PRIMARY MATRIX
R308 68K
R309 68K
R302 22
R315 68K
R314 68K
C304
R360 150K
SECONDARY MATRIX
TO R106 (POWER SUPPLY)
B301
C305 .001
R321 470K
R320 10
R316 5.6K
V306 6AU6
R322 1M
R317 5.6K
V304 12AT7
R313 47
V305 12AU7
R318 68K
R319 68K
C305
PRIMARY MATRIX
R361 150K
SECONDARY MATRIX
TO R116
B302
C306 .001
R325 68K
C307
R324 68K
R331 470K
R330 10
R326 5.6K
V307 12AT7
R323 47
V309 6AU6
R314 1M
R327 5.6K
V308 12AU7
R328 68K
R329 68K
C308
PRIMARY MATRIX
R362 150K
SECONDARY MATRIX
TO R126
B303
C301 .001
R335 68K
C310
R334 68K
R341 470K
R340 10
R336 5.6K
V310 12AT7
R333 47
V312 6AU6
R342 M
R337 5.6K
V311 12AU7
R338 68K
R339 68K
C311
PRIMARY MATRIX
R363 150K
SECONDARY MATRIX
TO R136
B304
C312 .001
R345 68K
C313
R344 68K
R351 470K
R350 10
R346 5.6K
V314 12AT7
R343 47
V316 6AU6
R352 1M
R347 5.6K
V315 12AU7
R348 68K
R349 68K
C314
PRIMARY MATRIX
R364 150K
SECONDARY MATRIX
TO R146
B305
C315 .001
TRIGGER FROM PIN # 9 V317B (UNIT SWITCHER)
-210V
R353 3K
SW301
SW302
SW303
SW304
TYPE 200 WAVEFORM SYNTHESIZER


PRIMARY MATRIX
-60V FROM V313 (POWER SUPPLY)
R201 12K
R202 100K
R203 THRU R208 - 100K
R209 100K
R210 100K
D203 THRU D208
R213 THRU R218 - 100K
D213 THRU D218
R223 THRU R228 - 100K
D223 THRU D228
R233 THRU R238-100K
D233 THRU D238
R243 THRU R248-100K
D243 THRU D248
R253 THRU R258-100K
V211A, V216A, V221A, V226A, V231A, V236A ALL ½12AU7'S
R263 THRU R268 - 100K
R273 THRU R278 - 10
V212, V217, V222, V227, V232, V237 ALL 6AU6'S
R290 THRU R295 - 47
V201A ½12AU7
V206A ½12AU7
V241A ½12AU7
V246A ½12AU7
V105A ½12AT7
L201
H.F. ADJ.
R281 3.9K
C201 7-45
PRIMARY MATRIX (PLUG-IN)
+250V
+100V
R286 47
MATRIX COMP.
R282 150K
R283
R284 1M
R285 47K
-210V
D231
V202 6AU6
V207 6AU6
6 IDENTICAL SECTIONS
(C2003 THRU C2008)*
V242 6AU6
V247 6AU6
C2009*
C2010*
* UNIT SWITCHER
SECONDARY MATRIX
-60V FROM V313 (POWER SUPPLY)
V201B ½12AU7
V206B ½12AU7
V241B ½12AU7
V246B ½12AU7
V105B ½12AT7
H.F. ADJ.
SECONDARY MATRIX (PLUG-IN)
V203 6AU6
V208 6AU6
6 IDENTICAL SECTIONS
(C2013 THRU C2018)*
V243 6AU6
V248 6AU6
C2018*
C2020*
* SELECTED VALUE
TYPE 200 WAVEFORM SYNTHESIZER


UNIT SWITCHER
PIN #1 V202
PIN #1 V203
PIN #1 V207
PIN #1 V208
R137 (POWER SUPPLY)
B201
B202
R2101 220K
R2102 220K
R2000 100K
+250V
READOUT LEVEL ADJ.
V204 12AU7
V209 12AU7
R2011 560K
R2002 560K
R2012 560K
C2001 3-12 **
C2002 3-12
C2011 3-12
C2012 3-12
R2021 100K
R2031 100K
R2032 100K
C2021 22
C2022 22
R2061 68K
R2062 68K
R2071 68K
R2072 68K
C2031 22
C2032 22
47Ω EACH GRID R2161 THRU R2180
R2081 68K
R2082 68K
R2091 68K
R2092 68K
-210V
R2111 12K
R2121 47
R2122 47
V205 6AU6
V210 6AU6
+100V
R2131 10
R2132 10
R2141 1M
R2142 1M
C2041 .001
C2042 .001
TRIGGER INPUT FROM PLUG-IN
6 IDENTICAL SECTIONS
B203 THRU B208
R2003 THRU R2008 - 560K
R2013 THRU R2018 - 560K
R2023 THRU R2028 - 100K
R2033 THRU R2038 - 100K
C2003 THRU C2008 3-12
C2013 THRU C2018 3-12
R2045 THRU R2056 - 56K
C2023 THRU C2028 - 22
C2033 THRU C2038 - 22
R2063 THRU R2068 - 68K
R2073 THRU R2078 - 68K
R2083 THRU R2088 - 68K
R2093 THRU R2098 - 68K
R2103 THRU R2108 - 220K
V214, V219, V224, V229, V234, V239 ALL 12AU7'S
R2123 THRU R2128 - 56K
V215, V220, V225, V230, V235, V240 ALL 6AU6'S
R2133 THRU R2138 - 10
R2143 THRU R2148 - 1M
C2043 THRU C2048 - .001
PIN #1 V242
PIN #1 V243
PIN #1 V247
PIN #1 V248
B209
B210
R2109 220K
R2110 220K
R2009 560K
R2019 560K
R2010 560K
R2020 560K
C2052 20MFD
V244 12AU7
V249 12AU7
V317A ½6AW8
R2114 (V209)
R2115 47
+250V
SCALE OF TEN (PLUG-IN)
R2116 47K
-210V
C2053 6.25MFD
R2112 1K
R2113 1W
-200V
PLUG
V317B ½6AW8
TRIGGER INPUT TO DECADE SWITCHER
R2117 47
T201
R2118 47
D2100
C2051 .001
.2052 .001
R2119 10
R2120 50K
DECADE TRIGGER ADJ.
R2129 47
R2130 47
V245 6AU6
V250 6AU6
R2139 10
R2140 10
R2149 1M
R2150 1M
.2049 .001
-210V
** C2001 THRU C2010 ARE PRIMARY READOUT COMP.
* C2011 THRU C2020 ARE SECONDARY READOUT COMP.
TYPE 200 WAVEFORM SYNTHESIZER

OPERATING PROCEDURE

I GENERAL

A. BASIC OPERATION

1. Turn rows C, D, & E OFF in Type 200
2. Turn all Secondary Matrix (red) knobs CCW in rows A & B
3. Set TIME/INCREMENT to 100usec
4. Connect MONITOR or MAIN OUTPUT to scope input
5. Connect SYNC OUT to external trigger input of scope
6. Set TRIGGER SOURCE to INT.
7. Set TRIGGER MODE to NORMAL

You should be observing twenty various voltage levels or increments each having a duration of 100usec. Adjust scope triggering so that #1 increment is at the beginning of trace.

8. Vary the Secondary Matrix (red) knobs and notice the individual widths vary. The overall waveform duration will vary since it is a product of the (number of increments switched) X (width of each increment).
9. Vary the Primary Matrix (black) knobs and notice the individual amplitudes vary.
10. Switch on rows C, D, & E; you should have 50 increments.
11. Change TIME/INCREMENT switch and notice that increment widths vary as a group but the width ratio remains constant.

B. AUXILIARY OUTPUTS AND CONTROLS

1. OUTPUT AMPLITUDE control varies overall waveform amplitude without affecting ratio of individual amplitudes.
2. SYNC OUT is used to trigger monitor scope when you are switching two or more rows.
3. SCALE OF TEN is used to trigger monitor scope when only one row is on.

C. APPLY MAIN OUTPUT TO YOUR CIRCUIT, INSTRUMENT OR SYSTEM

II TIMING

A. TIME/INCREMENT Switch

This switch determines the fixed minimum rates at which the internal trigger generator can run. The actual trigger rate to the increments is controlled by the additional delay which each variable width setting adds in.

B. VARIABLE WIDTH

This is determined for each individual increment by the setting of the Secondary Matrix knobs. When all these knobs are turned to maximum CCW position, the time of each increment corresponds to the setting of the TIME/INCREMENT Switch. When any Secondary Matrix knob is turned CW the time before the next trigger or increment can be generated is extended by the amount of width or delay (up to 10 times the setting of TIME/INCREMENT) added in by that one knob. Each variable width control acts independently of any other.

III TRIGGERING

A. INTERNAL - NORMAL

The operation in this position was fairly well described in I and II. The triggering or increment generation is wholly internal at a rate determined by the TIME/INCREMENT Switch and individual variable width (Secondary Matrix) knobs. The output pulse waveform will be continuously repeating at a time or frequency equal to the product of (number of increments being switched) X (increment width).

B. EXTERNAL - NORMAL

In this position each increment is singly triggered by each external trigger or MANUAL TRIGGER. The increment time or width will be wholly controlled by the external trigger rate AS LONG AS THE TIME/INCREMENT & VARIABLE WIDTH SETTING DOES NOT EXCEED THE TIME BETWEEN EXTERNAL TRIGGERS. For example: If the increment duration as set by the TIME/INCREMENT and variable width setting would have been less than 1msec. on any individual increment, a 500 cycle external trigger rate would produce increments durations of 2msec. However, if the external trigger rate were 10 KC, the increment duration would correspond to the combined TIME/INCREMENT - variable width time.

C. INTERNAL - TEN COUNT

In this position the individual increment width is determined as in the INTERNAL-NORMAL operation. However, any one of the rows of ten increments can be sequentially triggered by the RESET button (manual operation) or externally. The RESET button or an external trigger "unlocks" the next row of ten increments to be switched and lets them run at the rate already determined by the TIME/INCREMENT - variable width combination. The repetition rate cannot exceed the sum of the durations of the ten increments being triggered plus a short "hold-off" time between rows.

When using a monitor scope, trigger it from the SCALE OF TEN in this mode of operation.

D. INTERNAL - PROGRAM COUNT

In this position again, the individual increment width is determined by the TIME/INCREMENT - variable width settings as in INTERNAL-TEN COUNT operation. As in the INTERNAL-TEN COUNT operation, the RESET button or an external trigger unlocks a group of increments, only this time it is the whole program of 20, 30, 40 or 50 increments (depending on how many rows are turned on in the Type 200) that is unlocked. Each trigger will cause the program to start at #1 increment in row A and run sequentially through the number of rows switched ON and return to #1 increment where it will wait for the next trigger. The repetition rate cannot exceed the sum of the duration of all the increments in the full program plus a short "hold-off" time between programs.

When using a monitor scope, trigger it from the SYNC OUT in this mode of operation.

E. EXTERNAL - TEN COUNT OR PROGRAM COUNT

This mode will have very limited application. Pressing the RESET button will "arm" or make the TRIGGER INPUT ready to receive external triggers. The MANUAL TRIGGER or an external trigger can now be used to trigger the increments one at a time through a count of ten or the whole program, depending on the TRIGGER MODE setting.

CALIBRATION PROCEDURE & MAINTENANCE GUIDE

This is the calibration procedure used at the factory which assures that the stated operational specifications can be met. We hope that you will find it useful for recalibration as well as in periodic trouble shooting and maintenance.

The trouble shooting suggestions have been arranged in order of progressive calibration. This is to allow you to more easily isolate the malfunction by its place in the sequence of operation. Since many later steps depend on the proper performance of prior operations, it would be most wise to check back to the beginning on all troubles and eliminate this possibility. For example if you have instability of several increments you might suspect the matrix or, quite logically, the trigger circuits. However, the trouble might well be the -210 volt power supply out of regulation. Eliminate fundamental problems (such as the power cord being plugged in!) before trouble shooting specific areas.

All tests should be made with a voltmeter having 20,000 ohms/volt and a dependable oscilloscope with the following characteristics.

(a) Input impedance at least 1 Megohm
(b) Horizontal sweep accuracy - 3%
(c) Capable of being externally triggered

CALIBRATION SEQUENCE — IF UNABLE TO MAKE SPECIFICATIONS

1. VISUAL CHECK
   - Obvious damage
   - Missing or unlit tubes
   - Wrong control settings
   - Improper test equipment

Install "C" unit in checked TYPE 200
Set TIME/INCREMENT to 100usec.
Turn Rows C, D & E OFF in TYPE 200
Turn Secondary Matrix (red) knobs CCW in rows A & B of the TYPE 200
TRIGGER SOURCE ..... INTERNAL
TRIGGER MODE ..... NORMAL

2. POWER SUPPLY VOLTAGES

At interconnecting plug check the following voltages

(a) -210
(b) -200
(c) +100
(d) +250

(a) (b) (c) (d)
Recheck Type 200
Check interconnecting plug

Put probe of test scope on pin 6 of V1
(Miller Run Up Tube)
Trigger scope internally

3. RATE GENERATOR

(a) Adjust RATE GEN STABILITY pot R29 until stable sawtooth appears

(a) Swing MILLER DC BALANCE pot thru its range
Run the RATE TIMING pot thru its range
Replace, one at a time, V1 thru V6
Pull V13

Set scope time to 10msec/div

(b) Adjust RATE TIMING
Adjust R62 for one sawtooth per 10msec

(b) Re-check all Secondary Matrix pots for full CCW
Check V11 and V13
Check Secondary Matrix input at R55. Should be at DC ground
Check Timing Switch components

(c) Adjust MILLER DC BALANCE ADJ. R66
Switch TRIGGER MODE between LOCKOUT and NORMAL
Adjust pot so that DC level observed is nearly the same in both modes. Sawtooth should not run in LOCKOUT MODE

A dual input scope should be used in the next check. Trigger scope from SYNC OUT and simultaneously observe pin 7 of V7 and pin 6 of V1

4. TRIGGER

(a) Check UNIT TRIGGER pulse
This should be a narrow positive going spike of 7 to 10V amplitude. It should exactly coincide with the sawtooth peak

(a) Replace V5 and V6
Reverse secondary or primary leads of T1
Replace T1

Place scope probe on SCALE OF TEN. Trigger scope internally. Turn scope gain up until unit switching spikes are visible on baseline.

(b) Adjust UNIT TRIGGER ADJ.*
R44 for optimum count of ten (observe spikes on baseline)

(b) Re-check 4 (a)
Replace V7
Re-check Type 200
Check UNIT TRIGGER ADJ. pot

(c) Check SCALE OF TEN for occurrence at beginning of each row and output of approx. 35V

Set scope input to DC and place probe on MAIN OUTPUT. Turn several Primary Matrix knobs alternately CW and CCW

5. OUTPUT

(a) Adjust OUTPUT LEVEL R89
for a center ground reference after checking range from 0 to +25V

* On some Plug-ins this may be labelled "HOR TRIG"

(b) Check range of OUTPUT AMPLITUDE R80 pot for 3 to 1 and maximum amplitude of at least 35 volts

(c) Adjust OUTPUT DC BALANCE R88 so that varying OUTPUT AMPLITUDE causes minimum DC shift

(a) (b) (c)
Replace V15, V14, V12
Check the pots

Place scope probe on pin 5, V14

(d) Adjust PRIMARY MATRIX COMP C29 for flat-top square wave

(d) Check Type 200 output
Replace C29
Replace V12

Place scope probe on MAIN OUTPUT

(e) Adjust OUTPUT COMP. C31 for flat-top square wave

(e) Replace V14
Replace C31

(f) Adjust H.F. RESPONSE L1 for best risetime without overshoot

(f) Check R83
Replace L1
Replace V14

Place scope probe on pin 7 of V11.
Turn several Secondary Matrix knobs CW

(g) Adjust SECONDARY MATRIX COMP. C24 for flat-top square wave

(g) Re-check Type 200 output
Replace C24

Monitor MAIN OUTPUT with scope.
Trigger scope from SCALE OF TEN
Set up "C" unit as explained under INTERNAL-TEN COUNT IN OPERATING PROCEDURE
Turn Rows C, D, E, ON in Type 200

6. LOCKOUT

(a) Check TEN COUNT LOCKOUT
Press RESET button and observe sequential row switching
Apply a minimum 10 volt, lusec risetime external trigger and observe sequential row triggering

(a) Replace V8, V9
Check SCALE OF TEN input at SWIA
Check pin 6, V8 for -90V pulse
Check pin 2, V8 for -5V differentiated count of ten
Check V9 grid divider resistors
Check C3 and D1

Set up "C" unit as explained under INTERNAL-PROGRAM COUNT in OPERATING PROCEDURE. Trigger scope from SYNC OUT

(b) Check PROGRAM COUNT LOCKOUT
Repeat 6 (a) Observe full program sequence

(b) Same as 6 (a) with PROGRAM COUNT

Set up "C" unit as explained under EXTERNAL-NORMAL in OPERATING PROCEDURE. Observe neon indication rather than triggering scope.

7. EXTERNAL - MANUAL TRIGGER

(a) Switch TRIGGER SOURCE
Switch between INTERNAL and EXTERNAL and adjust RATE GEN. STABILITY, R29 so that there is no triggering in EXTERNAL

(b) MANUAL TRIGGER
Check operation for sequential triggering of individual increments

(b) Check for 40V spike at junction R20/R21
Check SW2
Replace V8

(c) TRIGGER INPUT
Apply a minimum 10V, lusec. risetime trigger and check for sequential triggering of one increment per input trigger.

(c) Check D2 & C7
Replace V8

(d) Readjust RATE GEN. STABILITY, R29 to compromise EXTERNAL TRIGGER sensitivity with step (a)

With the scope still on the "C" MAIN OUTPUT, set sweep time to 10msec/div
Turn C, D & E rows off in Type 200
Turn SECONDARY MATRIX controls FULLY CCW
Trigger scope from the SYNC OUT
TRIGGER MODE ..... NORMAL
TRIGGER SOURCE ..... INTERNAL

8. TIMING

(a) Set TIME/INCREMENT at 10msec and adjust RATE TIMING, R62 for exactly one increment per 10msec on scope

Change scope sweep speed to 2usec/div and the TIME/INCREMENT switch to 2usec

(b) Adjust C20L (on TIME/INCREMENT switch) for exactly one increment per 2usec. on scope

Change TIME/INCREMENT to 3.3usec.

(c) Adjust C20K for exactly 6 increments in 20usec

Change scope speed to 10usec/div
Change TIME/INCREMENT to 10usec

(d) Adjust C20J for exactly 1 increment per 10usec

Change TIME/INCREMENT to 33usec

(e) Adjust C201 for exactly 3 increments per 100usec

(f) Check all remaining timing positions for ± 3% accuracy and retrim fast ranges until within ± 3%

(a) thru (f)
Replace V13, V1
Check pot and timing capacitors

(g) Check Variable Width ratio on all ranges for 10 to 1 coverage. Use #2 Secondary Matrix knob in row A

(g) In the 2usec. position Variable Width range may properly be as low as 8 to 1
Replace V13, V1
Check amplitude of Secondary Matrix from Type 200

9. GENERAL OUTPUTS

(a) Check SYNC OUT for positive going, 15 volt gate

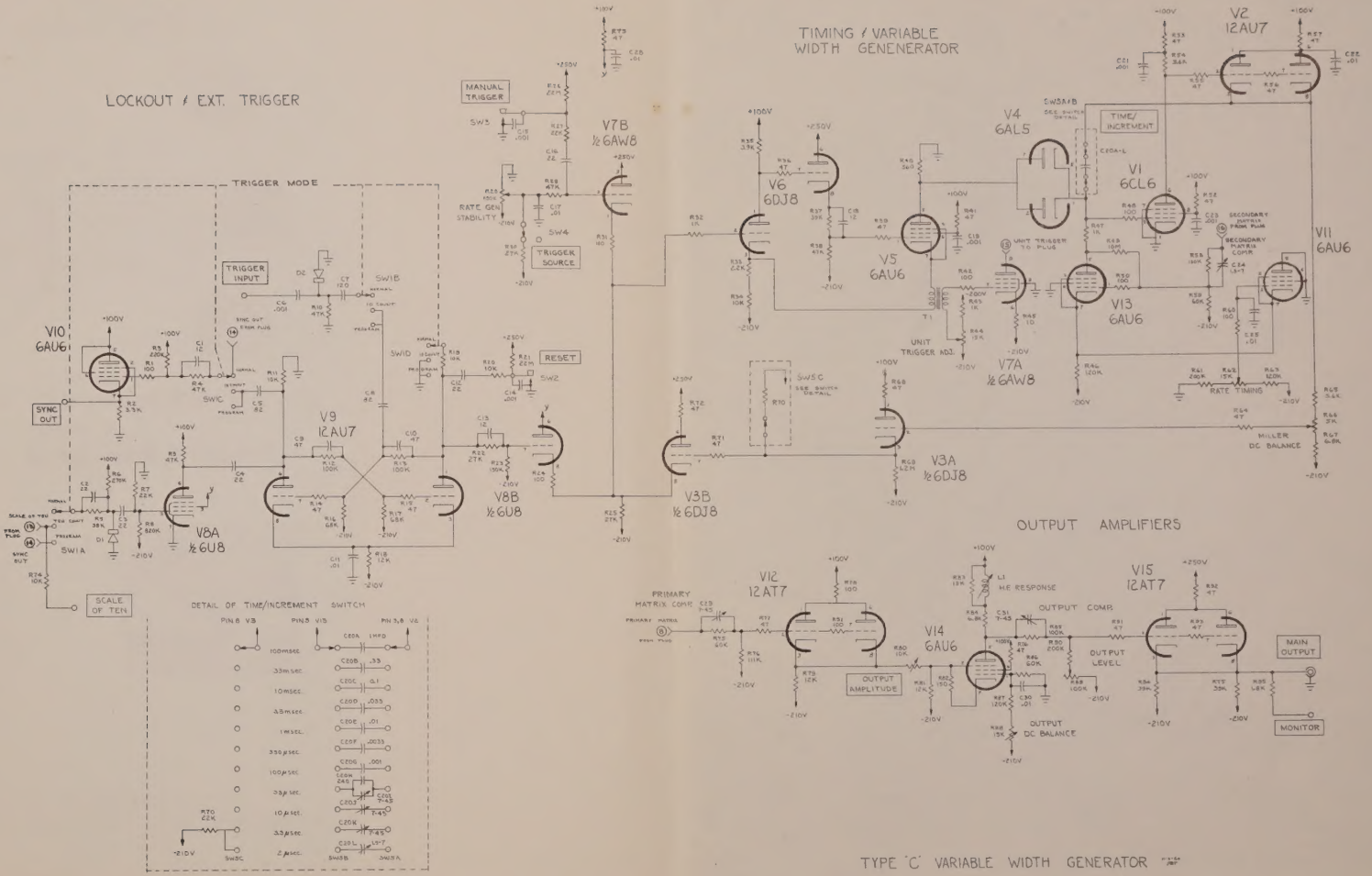
(a) Replace V10

(b) Check output waveform hum for less than 0.1 volt

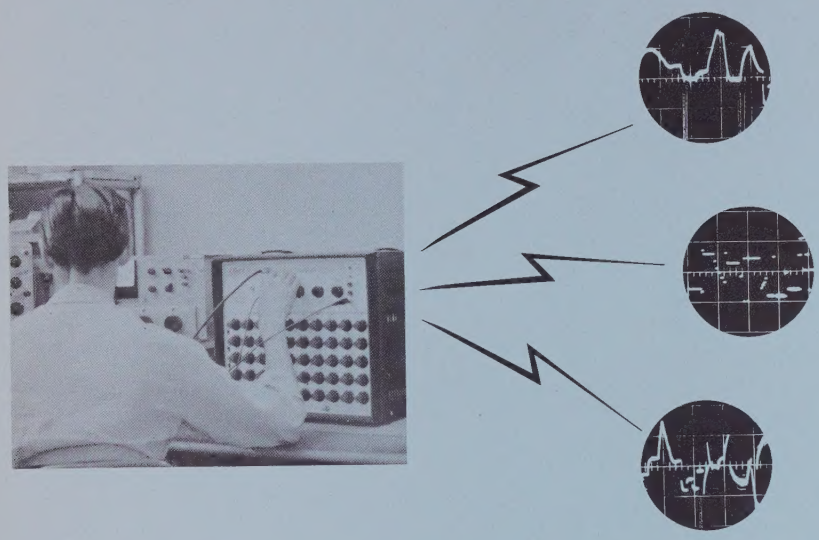
(b) Change V15, V14

(c) Check incremental time jitter for 1 part in 500

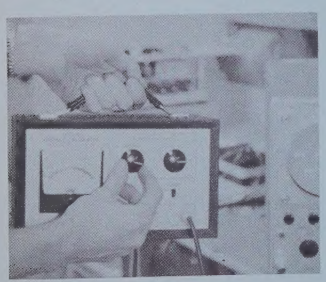
(c) Replace V4, V1

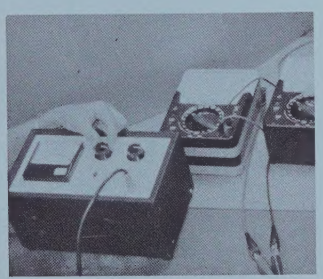

LOCKOUT / EXT. TRIGGER
TRIGGER MODE
TRIGGER INPUT
SYNC OUT
SCALE OF TEN
MANUAL TRIGGER
RATE GEN STABILITY
TRIGGER SOURCE
RESET
V10 6AU6
V9 12AU7
V8A ½6U8
V8B ½6U8
V7B ½6AW8
V6 6DJ8
V5 6AU6
V4 6AL5
V3A ½6DJ8
V3B ½6DJ8
V7A ½6AW8
V1 6CL6
V2 12AU7
V13 6AU6
V11 6AU6
TIMING / VARIABLE WIDTH GENENERATOR
TIME/INCREMENT
UNIT TRIGGER ADJ.
RATE TIMING
MILLER DC BALANCE
SECONDARY MATRIX COMP.
OUTPUT AMPLIFIERS
PRIMARY MATRIX COMP.
OUTPUT AMPLITUDE
OUTPUT COMP.
OUTPUT LEVEL
OUTPUT DC BALANCE
MAIN OUTPUT
MONITOR
V12 12AT7
V14 6AU6
V15 12AT7
DETAIL OF TIME/INCREMENT SWITCH
100m sec.
33m sec.
10m sec.
3.3m sec.
1m sec.
330 μ sec.
100 μ sec.
33 μ sec.
10 μ sec.
3.3 μ sec.
2 μ sec.
TYPE 'C' VARIABLE WIDTH GENERATOR

CONDENSED CATALOG



WAVEFORM SYNTHESIZERS AND VOLTAGE CALIBRATORS





EXACT

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